This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

Br
2 39
165
WIDENER
HN ZM71 J
3 2044 012 940 672

Captain Coles and the Admiralty - 1866

Br 239.165

Harvard College
Library

FROM THE FUND BEQUEATHED BY

Archibald Cary Coolidge

Class of 1887

PROFESSOR OF HISTORY
1908–1928

DIRECTOR OF THE UNIVERSITY LIBRARY
1910–1928

CAPTAIN COLES AND THE ADMIRALTY:

WITH AN ENQUIRY INTO THE ORIGIN AND QUALITIES OF

THE TURRET SYSTEM

OF

ARMOUR-CLAD WAR VESSELS.

By the Son of

AN OLD NAVAL OFFICER.

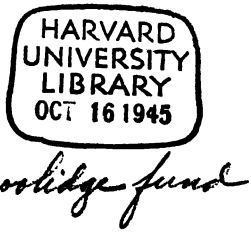
LONDON:

LONGMANS, GREEN, AND CO.

1866.

Price One Shilling.

Br 239.165



LONDON
PRINTED BY SPOTTISWOODE AND CO.
NEW-STREET SQUARE

CAPTAIN COLES AND THE ADMIRALTY.

For some years past public attention has been invited to the griefs of Captain Coles, and the virtues of his cupola system. Since the method of covering war-vessels with armour-plating has been introduced, two methods of constructing such vessels have been propounded. In the first, the guns are carried in a central fort, formed by covering the middle portion of the ship with very thick armour, while an armour bulkhead or division is introduced before and behind the middle part, so as to form it into an impregnable box or square tower. In the second plan, the guns are carried in round towers or cupolas, which pass through openings in the upper deck, and which are capable of being turned round on their axes by appropriate gearing. The central fort system, which is the natural successor of the ordinary broadside system, is the system now generally adopted in our ships of war, and it has resulted from the sense of the necessity of using thicker armour in the vital parts of the vessel than was supposed to be adequate when our early iron-clads were built. Mr. Reed, the chief constructor of the Navy, seeing that he could not cover the whole of a vessel with really efficient armour without sinking her too deeply in the water, has been content to cover only the central part and a belt at the water-line—leaving the rest of the vessel clear of armour altogether, since no benefit, it was plain, would be obtained by the pretence of a protection over the whole vessel that would

be heavy enough to encumber the ship, but too weak to prevent the penetration of shot from a class of gun now becoming general. The cupola or turret system is the system advocated by Captain Coles, and its merits have now been loudly vaunted, throughout the newspapers and by other means of popular agitation, for some years. Captain Coles maintains that by the turret system of construction he can with a given size of vessel carry a heavier armament, manœuvre his guns with greater facility, and attain a higher speed. The Admiralty, however, refuse to take Captain Coles' *ipse dixit* for all this: they require more cogent evidence of feasibility, and have so far been unable to see how a vessel with a given displacement and a given thickness of armour can carry more or heavier guns, or attain a higher speed, when laden with the addition of several turrets weighing from 100 to 150 tons each, than it would be possible for the same vessel to do when not so encumbered. With regard to the manœuvring of heavy guns, it is now known that, by the aid of appropriate mechanism, such guns can be as easily managed in broadside as in turrets; and the new American steamer, *Madawasca*, is fitted with such machinery, which has been found to be perfectly successful in manœuvring guns of fifteen inches bore. In vessels like the *Bellerophon*, which are fitted on the central fort system, one main point of dependence in action will be the power of rapid evolution possessed by the vessel herself, from her shortness, from the possession of a balanced rudder, and from other peculiarities of construction all intended to confer the property of mobility both easy and rapid; whereas, in the case of turret vessels, the same ends are subserved by the power of turning the turrets on their axes, carrying the guns with them, whereby the fire may be discharged in any required direction.

Now some few years since the duty devolved upon the Admiralty of undertaking the construction of an iron-clad fleet which should be at least equal in efficiency to

anything our neighbours could show; and the alternative lay before them of building those vessels on the ordinary and accredited system of broadside armament, or of adopting the turret system of Captain Coles—then a crude and untested novelty, and even now, as carried out by him, marked by fatal imperfections. Of course there was only one decision to which, under such circumstances, the Admiralty could come; and the result is that we have now a fleet of broadside armour vessels unequalled in the world. But the Admiralty, while resting their main hopes of efficiency on the ordinary system of armament, thought it right, at the same time, to make trial of Captain Coles' plan; and the *Royal Sovereign*, and subsequently the *Prince Albert*, were fitted with his turrets. It is said, by Captain Coles and his friends, that this was only done after great delay. But up to the time the *Royal Sovereign* was undertaken Captain Coles had no plan sufficiently definite for any practical man to deal with; and it was manifestly impossible for the Admiralty to give effect to the intentions of an inventor when he did not know what he intended himself. The idea of protecting guns by shields first occurred to Captain Coles, he says in one of his letters to the *Times*, in November 1855; and he then proposed to place his guns under a fixed shield set upon a raft which could be easily turned. A drawing of this cask-raft will be found in No. 14 of the *Journal of the United Service Institution*, and it has not the least analogy or relation to an iron-clad vessel of any kind, and could certainly afford no aid to the Admiralty in the reconstruction of the fleet. In 1859, Captain Coles says that it was suggested to him by Mr. Brunel that it would be better to place his shield and gun upon a turn-table than to have to move the raft to point the gun; and there can be no doubt that this idea was a great improvement upon its crude predecessor. But although Captain Coles had thus acquired from extraneous suggestion some idea of how to move his shields, he had not yet been able

to make up his mind what should be the shape of them. At one time they were to be hemispheres; at another, cones; at another, half conical and half cylindrical structures; and, in fact, nothing was definitively fixed until, in 1862, the first monitor came out in America, when Captain Coles adopted the monitor form of turret for the *Royal Sovereign*; and to that pattern he has ever since adhered. The fact is, up to this time Captain Coles never had any articulate plan at all. He had only a vague idea, the form of which was constantly wavering in his own mind; and is it to be a ground of objection against the Admiralty that it refused to expend the public resources upon crudities so undigested that the authors of them did not themselves know what they wanted to have done?

So far, then, it appears that, up to the advent of the monitor system and the fitting of the *Royal Sovereign*, any delay which took place in testing the cupolas or shields of Captain Coles arose mainly from his own incertitude and vacillations. I shall presently show that whatever delays have occurred since that time in constructing a sea-going turret vessel is equally imputable to Captain Coles' impracticability; and I would only here remark that he has, from first to last, been treated by the Admiralty with all possible indulgence. Although confessedly quite ignorant of shipbuilding and engineering, his services were retained by the Admiralty to advise in the construction of such turret vessels as might be undertaken. In this engagement Captain Coles stipulated that he should be at liberty, whether by his writings or lectures, to advocate the advantages of the turret system—a course to which the Admiralty acceded, and to which they could have no real objection, seeing that all systems were alike to them, except in so far as any of them might be found to be superior; and they had a manifest interest in discovering and adopting the best. But when Captain Coles, instead of contenting himself with pointing out the benefits of his

own projects, proceeded to attack and disparage the plans of his coadjutors at the Admiralty, who were precluded by the reticence imposed by their official position from exposing these mis-statements—when in letters to the *Standard* and other papers he underrated the speeds of the vessels with which he contrasted his own,—when he mis-stated their comparative armaments on the frivolous pretext that he intended to fit his vessels with rifled guns which could carry heavy bolts, although it was equally in the option of the other vessels to carry these guns also,—and when, finally, he adopted Sir James Elphinstone's disingenuous assertion that the *Pallas* had had four or five feet of solid oak bolted to her bows to alter her shape forward, whereas the only addition was a narrow piece of wood, somewhat of the nature of a cutwater, bolted to the stem; the Admiralty—in justice to their other servants, and for the maintenance of that discipline which is indispensable to the proper working of every great establishment—had very little option but to suspend Captain Coles, which accordingly they did, and which penalty he has certainly brought upon himself by his factious misconduct. But the objection is now raised by his friends whether, even admitting the indecorum of Captain Coles' proceedings, the Admiralty is itself wholly free from blame in having caused his discontent, and whether it is just to the country that the Admiralty should sacrifice a scientific officer to its own sense of dignity when the result may be such a loss of efficiency in the Navy as may be fatal to our maritime supremacy. Now, while everyone must regret that a naval officer should place himself in such a state of an tagonism towards his superiors as to compel his dismissal, and while everyone will further admit that Captain Coles, in pressing the turret system upon the attention of the Admiralty so persistently, has gained for it more attention than it might otherwise have attracted for some years, it is impossible to suppose that the Admiralty should not be able to construct such turret vessels as we may require as

well without Captain Coles' co-operation as with it, seeing that the principle has in the meantime received far more important illustration in America than Captain Coles could ever give it; and seeing, further, that Captain Coles utterly disclaims the possession of any such shipbuilding or engineering knowledge as would assist in giving greater perfection to the details. It is alleged indeed that, in the absence of Captain Coles, it is upon Mr. Reed that the construction of turret ships must devolve, and that he, having been the great opponent of the system, could not be expected to give it fair play, even if he understood it, which is doubtful; and that in any case he could not be expected to understand it so well, or to take so great an interest in its success, as the inventor. Now, seeing that Captain Coles is neither shipbuilder nor engineer, and seeing, further, that before the Admiralty would be warranted in spending a large sum of money upon any vessel, they must possess some reasonable assurance, from the report of their own responsible officers, that such vessel would at least swim, and would not inevitably be so utter a failure as some of the turret vessels pressed upon the Admiralty would, if sanctioned, have been; it is upon Mr. Reed, as the official adviser of the Government, that the responsibility of producing a reasonably efficient vessel must in any case chiefly devolve, seeing that Captain Coles could not be trusted with such a task: and this would equally be so whether Captain Coles were associated with Mr. Reed in the production of the vessel or not. Nor is it correct to say that Mr. Reed is the great opponent, or an opponent at all, of the turret system. In a lecture delivered by him so far back as March 1863, he says: 'I have no prejudices, I may say, against these vessels. I was one of the first, if not the very first person, who asked, through the press, that a thorough and impartial investigation of the cupola system should be entered upon. I am still most anxious to ascertain their best capabilities. But there are difficulties in the way of using the cupola for

sea-going purposes, as I will try to explain to you.' If Captain Coles had been able to show how these difficulties could have been surmounted, he would have rendered a meritorious service, and one much more to the point than any number of querulous letters to the newspapers can ever constitute. But, instead of doing this, he has addicted himself to abuse of Mr. Reed and his ships, and has committed himself to warped and erroneous statements in disparagement of his coadjutors at the Admiralty, which surely could not be necessary for the vindication of an invention of manifest efficiency and importance. Add to this the fact that Captain Coles is not the inventor of the turret system at all—that every phase of the idea has been copied from Ericsson, in New York, except the details, which are most imperfect, and which Captain Coles can confessedly do nothing to improve—and it will at once be understood how slight is the warrant for that admiration which Captain Coles has been receiving from his ignorant followers, and how delusive would be the hope that the Admiralty could derive either aid or confidence from such a second-hand inventor. Indeed, if Captain Coles were to be stripped of all that does not belong to him, he would have few feathers left. In a lecture delivered before the United Service Institution, in 1863, he stated that to the engineers of this country he left the task of making his turret work. But the turret itself belongs to Ericsson, and if Captain Coles originated neither the turret nor the mechanism, what can have been his part of the invention?

In a letter from Sir James Elphinstone to the *Times* of the 14th December 1865, advocating Coles' pretensions, there are, among many disingenuous and several preposterous statements, some remarks in which I agree. I think with Sir James that the Admiralty should embody and utilize for the service of the country the highest measure of proficiency which they can possibly command; and it was no doubt in pursuance of this idea

that they acquired the services of Mr. Reed as chief constructor of the Navy, who stood commended, not by any political interest or aristocratic connection, but by his own energy and efficiency as a practical naval architect. Well has he justified the selection; and not the least claim which he has upon the public approbation is the intrepidity with which he has withstood the interested advocates of the turret clique and their blatant supporters in and out of Parliament, who appear to have supposed that they could beat down the sentinel of the public interests by force of abuse, and that they might dispense with the production of fact and argument, provided only they made noise enough. I deny Sir James Elphinstone's statement that Mr. Reed has built ships which fail to fulfil any condition of their specifications, the fact being that those conditions have been fulfilled in every case with singular success. Nor do I think it very ingenuous to tell the public that the reconstruction of Mr. Reed's ships begins the day they are launched; and to adduce, in evidence of the truth of that assertion, that 'the *Pallas* was launched months ago, and since that time has been continually in the hands of the dockyard,' when it must have been perfectly well known to the writer that the 'dockyard' was employed after the launch of the *Pallas*, not in reconstructing her, but in fixing on the armour-plating, in putting on board the masts and yards, the engines and boilers, and in fitting out the vessel just in the same way in which all vessels are fitted. Statements such as these defeat their object, as they are so obviously the mere tirade of a partisan. And while I think it incumbent upon the responsible officer at the Admiralty, who declines to entertain, not a crude project, but a matured and promising invention, to be able to give clear and solid grounds for its rejection, the obligation on the part of the Government and the public is equally exigent that they shall not permit such officer, whoever he may be, to be hounded to death for the conscientious discharge

of his duty, or to be made the target at which every barbed and poisoned shaft which faction can forge shall with impunity be discharged.

With regard to the jeopardy to which our naval power is supposed to be subjected by the loss of the services of Captain Coles, never was there in this world a more visionary apprehension. Here is a man who has not originated anything, and who admits himself to be without those mechanical attainments which could alone enable him to amend the faults of the existing turret mechanism. Who ever heard of him before this turret controversy arose? Yet this is the person to whom this mechanical and engineering country is to look for the right solution of an engineering problem fraught with important consequences to our national welfare. Moreover, I totally deny the accuracy of Captain Coles' assertion, that it is the first duty of the Admiralty to build a new sea-going turret ship as a solution of the turret question. Their first duty I maintain to be to ascertain by actual experiment whether the turret vessels already built under Captain Coles' auspices are shot-proof or not, and if not, what is necessary to be done to render them so; for it would manifestly signify little that a turret ship should be proved to be seaworthy, unless it has first been ascertained that she is shotworthy also. The mode of construction which Captain Coles has adopted for his turrets involves the necessity that they shall rest on the lower deck; and they pass through great holes in the upper deck, with an annular opening left round each turret to permit its free revolution. This annular space it is difficult to keep water-tight; and if the strip of leather put over it were to fail and the vessel were to be very low in the water, the leakage through the openings round the various turrets might be so great as to sink the ship. This weak part of the design involves the necessity of the upper deck being kept so far above the water as to obviate the risk of any large volumes of water coming upon it. But

a high upper deck involves a high side, and as the side has to be covered with armour, and as the weight of the turrets has also to be carried, it follows that the armour of the sides and turrets cannot be very thick, else the vessel will be unable to support the weight placed upon her. The result is that the side of Coles' vessels are not, and cannot be made, shot-proof against heavy guns; and I maintain that a single 15-inch shot from one of Rodman's guns—such as are now in common use in America, Russia, Sweden, and other countries—if directed against the stern of the *Royal Sovereign*, would disable her at a blow, by breaking up the gingerbread work of toothed wheels and winches which turn the turrets, and jamming the whole fast so that the turrets could not be moved. The firing of such a shot against them is the first experiment we require with one of Captain Coles' turret vessels, and until this experiment has been tried, and until it can be shown that such a shot can be withstood, it is a mere waste of money to go on building more of such penetrable structures, whether for going to sea or for any other purpose whatever. Nor is the necessity so great as is commonly supposed of testing by experiment the capability of turret vessels to encounter heavy seas, seeing that this question has already been solved for us by the Americans, who possess fifty monitors in their fleet, and these vessels were for two years engaged on a stormy coast in all weathers, and proved themselves not merely to be perfectly safe, but the healthiest vessels in the fleet. Captain Rodgers, the commander of one of the monitors, reports that in a frightful gale, with the waves thirty feet high, his vessel behaved admirably, and proved herself a perfect sea-boat; and the whole tenour of the reports received from other commanders is to the same effect. There is no difficulty, therefore, in believing that a turret vessel may be made seaworthy. But what is wanted to be proved is, that the *Royal Sovereign*, or any other of

Captain Coles' vessels, if she encountered a monitor, would not be sent to the bottom in five minutes.

I have already shown that the delays which occurred in the testing of the turret system, up to the time the *Royal Sovereign* was fitted, must be mainly imputed to Captain Coles himself; and that the delays which have arisen in the preparation of a sea-going turret ship are traceable to the same intractable source, the following facts will demonstrate:—After the *Royal Sovereign* had been tried, a conference was held with Captain Coles at the Admiralty, at which various distinguished officers were present, and it was then resolved to proceed with the construction of a sea-going turret vessel. Captain Coles stated that, as he was not a naval architect, he wished to be charged with the construction of the turrets of the proposed vessel alone, leaving the design of the hull of the ship to be made by the Admiralty in the usual manner. The Admiralty acquiesced in this proposal, and Mr. Reed, having been called upon to say what model he considered most suitable, suggested that of the *Bellerophon*. But Captain Coles preferred the model of the *Pallas*, and ultimately he was furnished with drawings of both vessels, on the understanding that he was to furnish a design for turrets suited to the model he selected. Instead, however, of producing this design, Captain Coles—while confessedly no naval architect—called in the aid of a Portsmouth draughtsman, and produced a plan of an entirely new vessel of his own, differing both from the *Pallas* and *Bellerophon*, and the Admiralty, instead of rejecting this plan, as they might fairly have done, immediately referred it to a committee of distinguished naval officers, of whom Lord Lauderdale (formerly Sir Thomas Maitland, of H.M.S. *Excellent*) was chairman, and by this committee Captain Coles' plan was not approved. The committee recommended the Admiralty to have another design prepared, which has now been done. Meanwhile, the blame

of the delay which has been caused by the wrong-headed proceedings of Captain Coles has been cast by him and his supporters upon the Admiralty, whereas the fault has been entirely that of Captain Coles himself, in having wandered so completely out of his province.

It is needless to multiply examples of the absurd exaggerations in which Captain Coles habitually indulges relative to the merits of his turret ships, or his equally absurd disparagement of vessels of the ordinary character. But I may take one specimen of this style of argument at random from a letter addressed by him to the *Times* on the 13th December 1865, in which he maintains that either of his turret vessels, *Scorpion* or *Wyvern*, is fit to engage the *Minotaur*, because at that particular moment the *Minotaur* happened to have on board only the same number of twelve-ton guns that was permanently fitted in the turret vessels. While, however, the turret vessels have in those guns their full complement, and can carry no more, there is nothing to prevent the *Minotaur* from carrying ten times that number; added to which the armour plating of the *Minotaur* is five and a half inches thick, backed with ten inches of teak, with strong frames and plating, whereas the armour of the turret vessels is only four and a half inches thick, backed by nine inches of teak, with half-inch skin plates, and five-inch frames; while in point of speed the turret vessels fall short of that of the smaller and much-abused broadside vessel the *Research*. So much for the value of Captain Coles' boast that the *Scorpion* or *Wyvern* could successfully engage the *Minotaur*—the fact being that the *Minotaur* could, from her superior speed, take up any position with reference to the turret vessels that she thought fit, and a single well-directed shot from one of her heavy guns would penetrate their armour, disarrange their turrets, and disable them altogether.

It is beside the present question to enter upon any examination of the merits of the vessels constructed from

the designs of Mr. Reed, seeing that it is not Mr. Reed, but Captain Coles and his pretensions, that are on their trial in these pages. Nevertheless, there has been such persistent and venomous attacks upon Mr. Reed, and such unfair disparagement of his vessels, that it will be proper to expend a few moments in recapitulating the main facts by which our opinions on such a subject must be determined. To anyone who has watched the movement of our naval affairs, it will have long been obvious how much increased energy and efficiency have been infused into the constructive department of the Admiralty since Mr. Reed's accession to office; and the virulence with which he is abused by certain parties shows this at least, that he possesses efficiency as a moving force. Nor will the public at large be slow to believe that some, at least, of the lustre of the Duke of Somerset's administration of the Admiralty is due to Mr. Reed's judgment and intrepidity, working under the direction of Admiral Robinson, the able Controller of the Navy.

Mr. Reed's first task, on taking office, was the conversion of some small wooden sloops into iron-clads. Of these the *Enterprise* was the first, and she carries her armour and armament under the prescribed draught of water, realises nearly half a knot more speed than was expected, and has been reported by Admiral Sir Sidney Dacres, who had her under him in the Channel Squadron, as more nearly coming up to his idea of what an iron-clad vessel ought to be than any vessel under his command. Though a small vessel, she was the first vessel which carried $6\frac{1}{2}$-ton guns into the Mediterranean; and she has earned so high a character for comfort and efficiency, that notwithstanding the encumbrance of her armour, she has been habitually selected to carry diplomatic officers from place to place.

The *Research* is the next vessel that was converted by Mr. Reed, and she also carries her armour well; sails better than many iron-clads of four times her size, and steams

nearly half a knot an hour faster than was expected. But her deck has been complained of by some persons as too low in the water; though whether this is a fault or not, there is much difference of opinion. The American monitors, though good sea-boats, are much lower in the water than the *Research*, as also are Captain Coles's turret vessels, *Scorpion* and *Wyvern*. But a quality which in them is considered no fault is proclaimed to be a serious imperfection when the vessel happens to be built by Mr. Reed.

The *Favourite* and *Zealous* were the next vessels converted by Mr. Reed, and they have been eminently successful. The *Lord Clyde* and *Lord Warden* are not conversions. They differ from the *Royal Oak* and *Prince Consort* class in having solid frames; much thicker armour, carried deeper below the water-line; loftier ports; protected guns, pointing ahead and astern; roomier decks; better accommodations; equal handiness; somewhat higher speed, and ram bows. I never yet met a naval officer who did not consider them a very great improvement on the previous class; and, so far as has yet been ascertained, these vessels have been quite successful. The *Bellerophon*, with her balanced rudder and other valuable improvements, has been a very great success; and combines, with a high speed, most effective armour, and a heavy armament, unexampled facility of evolution. These are the principal vessels Mr. Reed has hitherto turned out; and where among them are his alleged failures? The fact is, the statements of Captain Coles' friends on this head are just as apocryphal as those which proclaim the superlative merits of his turret vessels, and they altogether break down when brought to the test of dispassionate examination.

I have already stated that, notwithstanding the overweening character of Captain Coles's pretensions, he is, in point of fact, not the inventor of the turret system at all. But I feel that this statement must appear so incredible,

and involves the supposition of such imperial assurance, that it will be proper I should offer such proofs of its accuracy as everyone will consider conclusive. In a letter to the *Times*, dated April 5, 1862, Captain Coles says that his experience in the Baltic and Black Seas in 1855 first suggested to him the idea of building impregnable vessels; and that towards the latter part of that year he had a rough model made by the carpenter of the *Stromboli*, and that he proposed to protect the guns by a stationary shield or cupola. But that meeting with no encouragement from the Admiralty, he consulted Mr. Brunel, who assisted him in various ways; and in March 1859 he produced drawings of a shield fitted with turn-tables. In December 1860 Captain Coles published drawings of his gun-shield and revolving platform in *Blackwood's Magazine.*

Now on the 26th of September 1854 Captain Ericsson, of New York, forwarded to the Emperor Napoleon a drawing of an iron-clad vessel, with a revolving iron-clad cupola protecting a gun, the receipt of which communication was immediately acknowledged by the Emperor; so that when in 1855 Captain Coles had just conceived the idea of a stationary shield placed upon a raft, the Emperor of the French had been for a year in the possession of a complete finished drawing of a partially submergible iron-clad vessel, with rudder and screw protected from shot by a projection of the deck, as in the monitors, and fitted with an armour-plated hemispherical turret or cupola, protecting a heavy gun. The turret was placed in the centre of the vessel, and was supported by a central shaft, as in the monitors, and turned by a steam-engine. Ericsson's plan was described in various journals published in America and on the Continent. But it was not until 1859 that Captain Coles proposed to make his stationary shield of 1855 capable of revolution. In point of fact, however, Ericsson's plan dates long before 1854, and had engaged his attention as far back as

1826; but it was produced in 1854 merely because the circumstances of that time seemed to call for such a contrivance; and when produced it was not an impracticable crudity like that of Captain Coles at its origin, but was a sound and workable invention, which had been well considered in every part. So much for Captain Coles' priority of invention; and yet this tardy imitator accuses Ericsson of having stolen his invention through the medium of woodcuts published in *Blackwood's Magazine* in December 1860!

Now, in referring to *Blackwood's Magazine* for December 1860, what do we find? We find a section and plan of a vessel, with the sides inclining from the water's edge, somewhat in the manner Ericsson had proposed six years before, and the inclined sides are also covered with armour, as Ericsson had previously suggested. To keep the sea from rushing up the inclined sides, vertical bulwarks of iron of the same scantling as those of ordinary vessels are carried up from the edge of the vessel to the top of the deck; and in a series of holes cut in the deck, a number of conical cupolas or shields are inserted. These shields are each composed of a heavy framework of timber, mounted on rollers like those of a railway turn-table, and they are covered with 4½-inch armour-plates. The largest internal diameter of these cupolas is about 15 feet, and their height from the floor 6½ feet, forming the frustrum of a cone; and within this cramped conical apartment, two breech-loading Armstrong guns are mounted, which guns are proposed to be fired with a service charge of 12 lbs. of powder. At first Captain Coles' revolving cupolas were to be hemispherical, being an exact imitation of the previously published plan of Ericsson, but they were changed to the conical form on the suggestion of Mr. Scott Russell —among other reasons, probably because they would thus be more easy of manufacture. It was with conical cupolas on this plan that Captain Coles first proposed to fit the *Royal Sovereign*, as appears from a lecture he delivered

before the United Service Institution in 1860, and from the drawings of the vessel as intended to be converted, published in the *Practical Mechanic's Journal* for August 1862. But an experiment made by Captain Coles of his plan, under the auspices of the War Department, in the iron-clad barge *Trusty*, showed that the project, if carried out in the manner then proposed, would prove a complete failure, and Ericsson's monitor turret, with muzzle-loading guns, was consequently substituted. This change of plan was announced in the *Times* of the 3rd January 1863, in the following words:—

> The word turret, made use of in referring to Captain Coles' ships, has been used advisedly—the sloping shields which were to crown the towers having been abandoned, together with the breech-loading ordnance for their armament. The *Royal Sovereign* at Portsmouth, and the *Prince Albert*, building by the Messrs. Samuda, will therefore now be fitted with turrets of a similar fashion to the *Monitor*, and will carry as heavy muzzle-loading ordnance as can be made for them.

It appears very plain from these dates and citations, 1st, that Ericsson had propounded the plan of an armour-plated revolving turret, protecting a gun carried in an iron-plated screw-vessel, before Captain Coles had turned his attention to the subject at all; and, 2nd, that Captain Coles, after having turned his crude project into a number of different shapes without success, had to abandon it in favour of Ericsson's monitor turret—retaining, however, certain features of his own, which give to the plan as heretofore applied by Captain Coles the stamp of fatal imperfection. What these damning faults are it will now be proper briefly to explain.

It has already been stated that Captain Coles carries his turrets on rollers on the lower deck, and the turrets pass through great holes in the upper deck, with an annular opening between the deck and each turret. It has further been already shown, that with these great

openings in the decks, and without any provision such as the monitors have for drawing the air required for the furnaces and for ventilation from a point adequately elevated above the water, he cannot keep his upper deck very low, and that high sides are only another form of expression for thin armour. Since, too, the portions of the turrets below deck are not protected by armour at all—except that on the outside of the ship—a single well-directed heavy shot might smash up the gearing of all the turrets at once, and disable the vessel altogether. But these do not constitute all the objections. Those who have had the opportunity of observing the effect of shot upon the monitor turrets know very well that a large quantity of iron débris is collected at the base of each turret, consisting of fragments of balls and shells, which, being broken up on the face of the armour, the fragments are projected in every direction with great force. Now, supposing Captain Coles' turrets to be strong enough to intercept the balls and break them up, as is done by the turrets of the monitors, the first effect of a hostile fire in going into action would be to jam the turrets altogether, for those fragments would be inevitably projected through the frail leather covering downwards into the annular spaces between the deck and the turrets, and some of the fragments would there stick fast and jam the turrets so that they could no longer be moved. The same effect would be produced by a heavy shot striking the deck where a turret passes through it, and in all its most vital points, the mechanism for manœuvring the turrets is mechanically defective. In some cases this mechanism consists of a circular rack, attached to the lower deck, into which a pinion works, driven by gearing at the circumference of the turret, and moving with it, while in other cases the circular rack is attached to the inside of the turret, and is moved by gearing fixed upon the deck. Both plans are faulty; for it is found, that when a turret is exposed to the shock of heavy ordnance, there is not

the least certainty that it will preserve a truly cylindrical form, and if it becomes oval, or otherwise distorted, the gearing will not work. In the monitors, all inconvenience from this cause is obviated by turning round the turret by means of a central vertical shaft, or spindle, the wheels attached to which will not be disturbed by any change in the external form of the turret, or by the concussion it suffers, and on this central pivot or spindle a considerable part of the weight of the turret is suspended. The monitor turrets have no rollers, but revolve on a ring inserted in the upper deck, and as ample means of lubricating the rubbing surfaces are provided, and as any desirable portion of the weight may be carried by the central shaft, the rotation of the towers by donkey engines provided for that purpose, is easily accomplished. Such an arrangement obviates all risk of the turret jamming by splinters, and it will continue to work efficiently, if it ceases to be round. In the turret of the *Dictator*, which is fifteen inches thick of iron, the donkey engines which rotate the turret are capable of exerting a force of 70,000 lbs. applied at its circumference, and this would suffice to turn the turret even if none of the weight were carried by the central shaft. Generally however, the step of the central shaft is keyed up in going into action so as to support about two-thirds of the weight of the turret and guns; and in going to sea it is let down a little, so that the rubbing surfaces may form a water-tight joint. Vessels thus constructed are known to be shot-proof; and during the recent civil war in America they have been hit several thousands of times by an enemy using the most powerful guns that Europe could furnish, without having suffered material injury. That such vessels are both healthy and sea-worthy, and that their 15-inch guns are able to destroy six-inch armour plates with ease, the extracts from official documents, which I append to these observations, sufficiently demonstrate; and instead of pottering longer with Captain Coles,

what it behoves the Admiralty to do is to look the facts of the American experience fairly in the face and to resolve that neither in power of guns nor in efficiency of armour we shall remain inferior to any nation in the world. Already other nations are taking the lead of us in this momentous race. The Baltic is swarming with monitors; and on the occasion of a recent visit paid by the Grand Duke Constantine of Russia to the King of Sweden, he was attended by a fleet of ten monitors, built from copies of the drawings from which the American monitors have been built. Swedish monitors on the American pattern also now navigate the Baltic; and very soon a number of Norwegian monitors, at present being built, will navigate the North Sea. Numbers of 15-inch guns are now being cast near Stockholm. Russia is arming herself largely with similar ordnance; and it is quite imperative that England shall not lag behind in the career of improvement, and subject herself to the risk of being boarded at her doors. We are all too apt to sink into complacency at the contemplation of our own perfections; and undoubtedly during the last few years we have done wonders in the progress we have made. But we certainly have nothing which we could oppose to such vessels as the *Dictator*, with her 15-inch guns, turret 15 inches thick of solid iron, and side armour 11 inches thick, backed by several feet of oak. Whatever we do now in the way of turret vessels should be an improvement upon that. We should begin where the Americans left off—utilising their precious experience, and carrying the principles they have proved to be sound and effective to a still more advanced development. Doubt is inadmissible where certainty can be obtained; and even if Captain Coles' arrangements were to all appearance as perfect as those of Ericsson, they would nevertheless be less eligible, for the simple reason that they are still untested in actual war.

Such, then, are the respective achievements of Coles and Ericsson in regard to the invention and construction

of turret vessels. But, apart from all recapitulation of the facts such as I have given, the presumption would certainly be, in any question touching the authorship of such an elaborate improvement, that it is to Ericsson, and not to Coles, that we are indebted for it. It is no disparagement of Captain Coles to say, that until this turret controversy arose, his name had never been heard of out of his own domestic circle; and he makes no pretensions to any mechanical genius such as distinguished the late Earl of Dundonald, or even to any such commonplace acquaintance with mechanical resources as ordinary engineers and shipbuilders must necessarily possess. On the other hand, Ericsson is known to be distinguished not merely by remarkable inventive genius, but for the last forty years he has been stamped as one of the most skilful engineers of the age, and one who has all the qualifications necessary for working out his conceptions to a practical and successful issue. While, therefore, a perfect and efficient turret system would be too much to expect from Coles, it would not be too much to expect from Ericsson — all his antecedents and his known talents being such as to warrant us in expecting from him the highest measure of improvement that the present age can produce. That this is no unmerited praise, will be obvious on referring to some of the improvements which Ericsson had perfected and brought into successful operation before the monitor system was brought out. I pass over his locomotive—the Novelty, constructed in six weeks for the Liverpool and Manchester Railway in 1830; for although it was the most symmetrical engine then exhibited, and attained the highest speed, it failed, in consequence of an accident, to obtain the prize; and the achievement, moreover, has little relation to war vessels. But the introduction of the screw propeller, which was in a great measure due to the ingenuity and enterprise of Ericsson, was the first important improvement in war vessels made in this generation; and Ericsson

simultaneously introduced the direct-acting engine for driving it, which species of engine has now been generally adopted. He soon afterwards constructed the *Princeton*, the first war steamer with the engines below the water-line. In the *Princeton*, in 1840, he introduced the first wrought-iron 12-inch gun; and he also contrived the method at present usually employed for gradually arresting the recoil by friction. For the French Government his agent, Count Rosen, constructed the *Pomone*, the first European war steamer with the machinery below the water-line; and for the English Government he constructed the *Amphion*, with direct-acting horizontal engines of a totally new type, since generally imitated in this and other countries, and which is recognised as the best form of screw engine yet introduced.

In 1841, Stevens, in America, having proposed to construct for the Government an armour vessel with plates $4\frac{1}{2}$ inches thick, which he alleged would repel shot and break it up, Ericsson demonstrated the hollowness of that theory by sending a shot from his 12-inch gun through a $4\frac{1}{2}$-inch armour target. The shot, weighing 224 lbs., fired with a charge of 30 lbs. of powder, after passing through the target, passed through a bank of sand 8 feet thick, and thereafter went out to sea. Not only is Ericsson a proficient mechanic, but an able officer of the Military Engineers; and, in regard to the penetrating power of guns, and to a correct estimate of the resisting power of armour, he had attained pretty near as much progress a quarter of a century ago as we have yet reached at the present day. From such a man the production of a new and more powerful system of armament and defence might reasonably be expected; whereas nothing short of a miracle could enable an amateur mechanic, of slow imagination and confessedly destitute of all practical resources, successfully to achieve such an important work.

APPENDIX.

Destruction of 6-inch Armour Plates, backed by 20 inches of Oak, by the 15-inch 'Monitor' guns; and Impenetrability of the 'Monitors' to the shot of any guns at present in use.

In a report addressed to the Navy Department in America, in February 1864, the following account will be found of the destruction of a 6-inch plate and its backing, by a single shot from the monitor gun:—

This target was made of one plate of French iron, 6 inches thick, furnished by Messrs. Petin and Gaudet, France, backed by 20 inches of solid oak. The target was placed on its longest edge against a bank of clay. Dimensions of target, 8 feet long, 39 inches wide, 6 inches thick; 11-inches gun; charge, 30 lbs. cannon powder; projectile, cast iron solid shot of 168¼ lbs. This shot struck in the centre of right half of target, indenting the plate 2½ inches, cracking it from top to bottom, and driving the target back 18 inches into the bank. The shot broke into numerous pieces. A shot was then fired from the 15-inch gun; charge, 60 lbs. cannon powder; cast iron solid shot of 425 lbs. The previous shot at this target drove the target back into the bank so as to make an angle with the line of fire from 15-inch gun of 55°. This shot struck in the centre of left half of target, breaking the plate into five pieces, and turning the target upside down. The shot glanced off, striking target No. 42, which is on the right of this target, breaking off a large piece of the plate, and passing into the bank. Shot not found. The timber backing is completely shattered.

It is generally supposed in this country that the destructive power of the American shot of large size and low velocity is not very formidable upon thick armour, and our best armour-plates are probably tougher and better than those made in

France. Nevertheless, this experiment and several others, to say nothing of the computation of the momentum resident in a 15-inch ball projected by a 60 lb. charge, make it quite certain that we have no armour-vessel in this country capable of resisting the monitor gun. That this is the conviction of the Americans is obvious, from the enormous difference in the thickness of their armour and of ours; for whereas our most powerful vessels have armour six or eight inches thick, the monitor turrets have armour fifteen inches thick, and either this must be much too thick or ours must be much too thin. On this head the Americans, having had much more experience in action than we have had of such structures, are no doubt right; and if there is any error, theirs is an error on the safe side.*

The confidence of the Americans in the shot-proof qualities of their monitors is manifested by many of the incidents of the late rebellion, one of which is that Captain Worden, of the monitor *Montawk*, attacked and destroyed the Confederate vessel *Nashville* when lying under the guns of Fort McAllister, in Georgia; and although the fort was all the time pouring a fire upon the monitor from its heaviest guns, the monitor took no notice of it, but proceeded without interruption to the destruction of her antagonist. Another new feature in naval war is, that in the attack on Fort Fisher, the fire of the rest of the fleet was directed against the fort over the monitors, and although shot falling short and shells prematurely exploding could not be prevented in such an engagement, the monitors, it was felt, were able to encounter such risks with impunity. The monitors, during two years of active service in all weathers on a hostile and stormy coast, sometimes watching for blockade-runners in Cuba, sometimes engaged in the Gulf of Mexico, and often at sea in heavy gales, were on an average each twenty-five times in action; being a larger amount of service than that of any vessels recorded in history. Shot could not damage them; storms could not swamp them; and at the end of the war they

* The question of making a gun that can employ 120 lbs. and 140 lbs. charges the Americans treat as already settled. The *Puritan's* turret will receive a pair of Rodman's 20-inch guns, the service charge of which is 120 lbs. Already the United States have a park of these formidable guns with spherical 1,000 lb. shot. The weight of each of these guns is 40 tons. Yet, on the monitor system these ponderous pieces are worked more easily by steam power than Nelson worked his 24-pounders. Ericsson maintains that his monitors should be built with only one turret, as by concentrating the weight of two or more turrets into one, that one may be made impregnable, and by similarly concentrating the weight of the guns, projectiles may be employed that will sink any vessel constructed on opposite principles.

were as effective as at the beginning. The following extract, from a report of Admiral Dahlgren, will show something of the kind of service in which some of the monitors were employed during three months in the summer of 1863, and the number of shots they fired and with impunity received:—

Extract from Admiral Dahlgren's Report on the service of Iron-clads, South Atlantic Blockading Squadron, showing the shots fired and the hits received by them during operations against Morris Island, from July 18th to September 8th, 1863, and the service at Sumter in April, and the Ogechee.

Name of Monitor	No. of shots fired		Hits	Hits April 7, 1863	Hits at Ogechee	Total hits received from the enemy
	15-inch	11-inch				
Catskill	138	425	86	20	...	106
Montawk	301	478	154	14	46	214
Lehigh	41	28	36	...	...	36
Passaic	119	107	90	35	9	134
Nahant	170	276	69	36	...	105
Patapsco	178	230	96	47	1	144
Weehawken	264	633	134	53	...	187
Nantucket	44	155	53	51	...	104
	1,255	2,332	718	256	56	1,030

Seaworthiness of the Monitors.

Of all the monitors employed during the war in America, two only have sunk, which under no circumstances could be asserted to be a large proportion of casualty. But the *Times* and other English papers have made such a rout about the matter, and have disseminated such erroneous impressions respecting it, that it is now a very common belief in England that the monitors are not safe vessels at sea. This conclusion, however, is quite erroneous, and the fact is, that the two monitors which were lost were lost from accidental causes which in no way disparage their seaworthy qualities. The first monitor was built in 100 days; she was not a large vessel, was very low in the water, and after having been in service for some time the joint of the turret on the deck was found to be somewhat leaky. As the vessel was about to be sent to New York for repairs, and had therefore to

perform a long sea voyage at an inclement season, the captain believed he would make the joint tighter by lifting the turret and placing oakum below it. This therefore was done. But the oakum was not strewed evenly on the surface, and lumps were left on which the turret rested, leaving the other portions without any weight upon them. The consequence of this state of things was that when the vessel got to sea the loose oakum was washed out of the joint, and the water came in faster than the moderately-sized pumps in the vessel could discharge it. The pumps were thus gradually overpowered, and in four hours the vessel foundered. Had the turret not been lifted, this accident could not have occurred, and any little leakage which existed through the joint could easily have been staunched by painting the exterior with a mixture of tallow and white lead. Another monitor, the *Weehawken*, sank during a gale in Charleston harbour, from the hatch having by accident been left off. The monitors being very low vessels, it is indispensable that in rough weather every opening in the deck shall be hermetically closed, just as in common vessels in such circumstances it is necessary to close any low ports in the sides; and in the monitors the air required for ventilation and combustion is consequently drawn through high and suitably constructed trunks, which will let in the air but keep out the water. It is pretty nearly as great a fault in the case of a monitor exposed to a rough sea to leave a great hole in the deck as to leave a great hole in the bottom; and although that class of vessel is provided with deck hatches, as ordinary vessels possess side-windows, it is only in favourable circumstances of wind and water in which it is intended they shall be opened. But for the accident of the hatch having been left open in the *Weehawken* when a storm came on, she would not have sunk; and such an accident says no more against her seaworthiness than the sinking of the *Royal George*, through the accidental entrance of the sea through her lower ports, would prove the unseaworthiness of that class of vessel.

Much more relevant to the present issue is the behaviour at sea of the very same monitor which afterwards went down in Charleston harbour; and upon this point I am able to adduce the conclusive testimony of her commander, which is as follows:—

Extract from the Report of Captain John Rodgers, of the Monitor 'Weehawken,' to the Secretary of the American Navy, dated January 26th, 1863.

The opinion formed then confirmed my anticipations, that a hull rising but little above the surface of the water (in this case only 16 inches), and having a central elevation, as in the monitors, is the shape to form a good sea-boat; and I am convinced that on this idea all successful ironclads must be built. This form reduces the surface to be plated to a minimum, and puts the part having the necessary elevation above the sea for fighting guns where it can be carried without inconvenience, and in the *Weehawken* is easily carried. With us I think safety is solely a question of strength.

I had relied upon former experience to correct any faulty motion which I might discover in a sea-way, by shifting or reducing weights. I abandoned, however, the idea of improvement. As I watched the action of the vessel it was perfect.

Extract from a Letter from Captain Rodgers to the Assistant Secretary of the United States Navy, dated July 22nd, 1863.

On Thursday night, when off Chincoteague Shoals, we had a severe gale from east-north-east, with a very heavy sea, made confused and dangerous by the proximity of the land. The waves I measured after the storm abated. I found them 23 feet high. They were certainly 7 feet higher in the midst of the storm.

During the heaviest of the gale I stood upon the turret and admired the behaviour of the vessel. She rose and fell to the waves, and I concluded then that the monitor form had great sea-going qualities. If leaks were prevented no hurricane could injure her. I presume in two days we shall be ready for any service, as we need no repairs, and only some little fittings.

It may be added, that, on the occasion of the heavy gale, which occurred just before the attack on Fort Fisher, the monitors were the only vessels of the fleet which were able to ride it out without dragging their anchors; and on the occasion of a common steamer having been sent to escort a monitor, before confidence had yet been established in the seaworthiness of that class of vessel, the steamer, having broken down in a heavy sea, was taken in tow by the monitor, and was carried by her safely into port. The *Dictator* at her load-draught displaces 62,000 lbs. to the inch, so that 16 inches height of side gives an

elevating force of nearly 500 tons, and enables her to rise sufficiently to the sea. The monitors neither pitch nor roll; and, although they take much water on deck, they are provided with efficient means for preventing its entrance into the vessel; whereas ordinary vessels are not so provided, and if a common good-sized steamer should happen to take in, through her engine-hatches or otherwise, 200 tons of water, the fires will be put out, and the vessel will probably founder in the way the steamers *Amalia* and *London* lately foundered in the Bay of Biscay. A monitor would have been quite safe in the gales in which those vessels went down, simply because effectual precaution is taken in her construction for preventing the entrance of water through openings in the deck.

Comfort and Healthiness of the Monitors.

The comfort and healthiness of the monitors will best be shown by a comparison of the cases of sickness occurring on board them with those occurring in the ordinary vessels of the navy; and this information is given in the following official statement:—

Extract from the Report of the Secretary of the United States Navy to Congress, respecting the Health of the Fleet.

It is gratifying to know that an examination of the sick reports, covering a period of over thirty months, shows that so far from being unhealthy, there was less sickness on board the monitor vessels than in the same number of wooden ships with an equal number of men, and in similarly exposed positions. The exemption from sickness in the ironclads is in some instances remarkable. There were on board the *Sangus*, from November 25th, 1864, to April 1st, 1865, a period of over four months, but four cases of sickness (excluding accidental injuries), and of these two were diseases from which the patients had suffered for years. In the *Montawk*, for a period of one hundred and sixty-five days prior to May 29th, 1865, there was but one case of disease on board. Other vessels exhibit equally remarkable results, and the conclusion is reached that no wooden vessels in any squadron throughout the world can show an equal immunity from disease. The facts and tables presented are worthy of careful study.

3 2044 012 940 672